

Applicants hereby amend the paragraph on page 1, beginning on line 12 of the specification as follows:

As known, digital filters include at least one delay unit and a coefficient network, which determine the cut-off/center frequency (i.e., f_c) of the filter. In some applications it is desirable to change the cut-off or center frequency of a filter in response to a control quantity (parametric filter).

Applicants hereby amend the paragraph on page 2, beginning on line 13 of the specification as follows:

The digital filter may be implemented with a recursive filter structure, such as for example digital wave filter structures. A filter element with a controllable phase angle (e.g., all-pass filter) is provided as the delay unit.

Applicants hereby amend the paragraph on page 5, beginning on line 19 and continuing on page 6 of the specification as follows:

$W(z)$ is the transfer function for an all-pass filter. The amplitude/frequency response $|H(z)|$ of the all-pass filter is constantly equal to one, which ensures that the amplitude/frequency response of the overall filter is not changed and that the first condition (i) is satisfied. Thus, a displacement or bending of the frequency axis occurs, and the displacement is controlled by the filter coefficient of the first-order all-pass filter. As a result, the filter coefficient value γ of the first-order all-pass filter is also called the frequency curvature parameter.

Applicants hereby amend the paragraph on page 6, beginning on line 3 of the specification as follows:

FIGs. 1A and 1B are block diagram illustrations of first-order all-pass filters. FIG. 1A illustrates a first order all-pass filter 20 that receives an input signal sequence $x[n]$ on a line 22. A summer 24 receives the input signal on the line 22 and the past value of the output signal $y[n-1]$ on line 26, and provides the resultant sum on line 28. The sum is input to a coefficient section 30, which multiplies the summed signal on the line 28 by the coefficient value γ . The product is output on line 32 to the summer 34, which also receives a signal on line 36 indicative of the past value of the signal on the line 28. The summer 34 provides the output signal $y[n]$ on line 38.

Applicants hereby amend the paragraph on page 6, beginning on line 10 of the specification as follows:

FIG. 1B illustrates another first order all-pass filter 40. This filter receives the input signal $x[n]$ on line 42 and sums this signal with a coefficient weighted feedback signal on line 44. A summer 46 provides a summed value on line 48, which is input to a coefficient multiplier 50 that multiplies the signal on the line 48 with the coefficient value $-\gamma$, and a delay element 51. The resultant product is output on line 52 and summed with a delayed version of the signal on the line 48, to provide the output signal $y[n]$ on line 54.

Applicants hereby amend the paragraph on page 9, beginning on line 8 of the specification as follows:

FIG. 6 is a detailed block diagram illustration of a computationally efficient embodiment for the parametric FIR filter illustrated in FIG. 5. The filter includes a plurality of series-connected delay elements (e.g., 70-72), summing nodes 74, 75 each inserted between two delay elements, and coefficient sections 78, 80. The input signals for the coefficient sections 78, 80 are picked up at the input of the delay element 70, the output of the summing node 74, and output of delays 71, 72. The coefficient sections 78, 80 include a programmable/adjustable coefficient value γ . The coefficient sections 78, 80 provide coefficient section output signals on line 82, 84, respectively, which are summed with associated delay element output signals to provide output signals to a multiplication network 90. Products from the multiplication network 90 are input to a summer 92, which provides an output signal on line 94.

Applicants hereby amend the paragraph on page 9, beginning on line 18 of the specification as follows:

Replacing a delay element in one of the traditional IIR filter structures with a frequency-dependent (dispersive) delay element as has already been explained for the FIR filter provides a structure that contains feedback branches that are free of delay, but which cannot be implemented in this way, as has been explained in the prior art mentioned initially. FIGs. 7 and 8 show a recursive biquad filter before and after the mapping, respectively. FIG. 7 is a block diagram illustration of a prior art biquad filter as an example of a second-order infinite impulse response (IIR) filter. FIG. 8 is a block diagram illustration of a modified biquad filter as an example of a second-order infinite impulse response (IIR) filter. The structure of a frequency-bending IIR filter (i.e., frequency warping IIR filter - WIIR) is obtained by replacing the delay elements illustrated in FIG. 7 with frequency-dependent delay elements 80, 82 having a transfer function $D(z)$, as shown in FIG. 8. FIG. 7 is based on the arrangement illustrated in FIG. 4, and has been expanded by a feedback network.